pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

September 28, 2022

Ms. Tiffani L. Doerr, PG
Evergreen Resources Management Operations
2 Righter Parkway, Suite 120
Wilmington, DE 19083

Re: Letter of Technical Deficiency
Sitewide Fate and Transport Remedial Investigation Report
Former Philadelphia Refinery
eFACTS PF No. 780190
3144 West Passyunk Avenue
City of Philadelphia
Philadelphia County

Dear Ms. Doerr:

The Department of Environmental Protection (DEP) has received and reviewed the June 30, 2022 document titled "Sitewide Fate and Transport Remedial Investigation Report (report), received on June 30, 2022 for the property referenced above. The report was prepared by Stantec Consulting Services, Inc. (Stantec) and submitted to DEP in accordance with the Land Recycling and Environmental Remediation Standards Act (Act 2), and it constitutes a Risk Assessment Report as defined in Chapter 3.

The procedures and regulations set forth in Act 2 must be followed in order for your site to qualify for the liability protection provided by the Act. Upon initial review, DEP finds the submission is technically deficient as the models do not sufficiently define the present and future extent of contaminants as required by 25 Pa. Code Sections 250.408(a), (b) and (e). The sections of the report, tables, figures, or appendices where additional information or explanation is required, or where otherwise deficiencies were identified are noted below.

Comment Number	Report Section	DEP Deficiency
1	Part 1, Section 3.2	Provide rationale for omitting surface water/detention ponds in Area of Interest (AOI) 8 but including the surface water/detention ponds in AOI 3 in cross sections, figures, and modeling efforts.
2	Part 1, Sections 3.2.1.2.2 and 5.3	Provide rationale for using isotropic hydraulic conductivity values for all model layers.

Comment Number	Report Section	DEP Deficiency
3	Part 1, Section 3.2.3	Reference is made that well gauging datasets were compiled, reviewed, and interpreted. Historical groundwater elevations and predicted groundwater elevations were tabulated for the water table and lower aquifers for the May 2014, May 2015, May 2016, May 2017, and June 2018 gauging events and presented in Appendix A; hydrographs were included as Appendix B. It was noted that many wells have limited datasets and some wells contain submerged well screens. The report also indicates that efforts were made to remove anomalous data points. Additional explanation is needed to identify locations and the basis for removing well data from the modeling effort. Additional figures and tables depicting the wells used for each model layer are needed).
4	Part 1, Section 3.2.3.1	Additional clarification is needed of the spatial distribution of well hydraulic head residuals for calibration datasets for each model layer. Figures 3-25 through 3-34 depicting color flood groundwater elevation surfaces should include hydraulic head residuals for the well points.
5	Part 1, Sections 3.2.3.2 and 3.2.3.3	The calibration data sets were all from the May and June timeframes from 2014 through 2018. Seasonal variability was reported to be limited as evidenced by continuous data logger monitoring in select wells throughout the facility. Figure 3-35 summarizes the data from dataloggers and Appendix B (hydrographs) depict gauging data per well. A review of the presented information indicates that data loggers were not deployed in AOIs 5 and 6, select wells with datalogger data were not used in the flow model calibration dataset, and layers 3, 4, and 6 did not appear to be evaluated as part of the datalogger data set. Clarification is needed to describe how seasonal variability was evaluated in datasets for AOIs 5 and 6, for wells completed in all model layers, and how calibration points were targeted for well points with more extensive data sets such as datalogger locations.

Comment Number	Report Section	DEP Deficiency
6	Part 1, Section 3.2.3.2.1	A review of the hydrographs also identified data presentation conditions that require further clarification. Light non aqueous phase liquids (LNAPL) may not be apparent in select wells due to water levels generally above the screened interval in dozens of wells across the site as indicated in the hydrographs included in Appendix B. There were also some wells where the corrected groundwater elevation was below the screen interval, or no groundwater elevation or apparent LNAPL thickness was reported. The wells to re-evaluate include: A-4, A-10, A-11, A-12, A-21, A-23, A-136, A-148, A-152, A-170, A-186, B-39, B-45, B-46, B-47, B-48, B-92, B-94, B-124, B-129, B-130, B-131, B-132, B-136, B-137, B-138, B-144, B-151, B-152, B-157, B-163, B-174, BF-100, BF-101, C-49, C-50, C-51, C-53A, C-54 through C-58, C-60, C-62, C-65, C-95, C-96,C-127, C-131, C-132, C-133, C-136, C-137, C-139, C-140, C-145, C-146, C-147, N-1, N-4, N-9, N-15, N-19, N-20, N-21, N-30, N-33 (no data), N-58, N-61, N-73, N-75, N-77, N-84, N-99, N-103, N-106, N-111, N-114, N-132, N-133, N-150, N-152, N-503, N-504, PGW-MW-4S (no data), PGW-MW-12D (no data), PGW-MW-12S (no data), PGW-MW-13D (no data), PGW-MW-13S (no data), PGW-MW-15S (no data), PGW-MW-21, PZ-132A, PZ-201, PZ-202, PZ-203, PZ-402, PZ-500, PZ-502, PZ-507, RW-6, RW-21, RW-31, RW-32, RW-65, RW-100, RW-101, RW-102, RW-103, RW-105 through RW-108, RW-113, RW-115, RW-116, RW-117, RW-122, RW-123, RW-126, RW-128, RW-200, RW-301, RW-302, RW-304, RW-305, RW-307, RW-308, RW-309, RW-402, RW-404, RW-405, RW-600, RW-702, RW-703, RW-704, S-1, S-5, S-8, S-10, S-12, S-13, S-16, S-20, S-22, S-36, S-39, S-46, S-52, S-76, S-82, S-86, S-153, S-211, S-213, S-225, S-226, S-268, S-308, S-355, S-367, S-370, S-385, S-418, S-871, S-82SRTF, S-83SRTF, S-108SRTF, S-109SRTF, S-137SRTF, S-138SRTF, S-139SRTF, S-141SRTF through S-144SRTF, SW-4, SW-5, URS-3, W-5, W-10, W-12, W-14, W-16, W-19, W-20, W-23, W-25, W-26, W-28, W-30, and WP-8.
7	Part 1, Section 3.3	Further documentation is needed to understand: 1) the numerical inputs used in the model for boundary conditions; 2) how each flow boundary (Fall Line, bulkheads, Mingo Basin, sewers etc.) was treated and assumed flow rates for each layer; 3) if inputs for the drain boundary for the sewers were the same across the site, 4) the rationale for the discontinuous horizontal flow boundary along portions of the Schuylkill River; and 5) the use of a general head boundary across ~75% of the model domain.

Comment Number	Report Section	DEP Deficiency
8	Part 1, Sections 3.3.2 and 5.2	Provide supporting evidence for treating the bedrock as a no-flow boundary in the numerical model.
9	Part 1, Sections 3.4 and 5.5	Further documentation is needed to understand: 1) the numerical inputs used in the model for water balance; 2) which model layers accounted for the various recharge and discharge features; 3) clarification of precipitation values and calculated recharge rate; 4) explanation of how leaking infrastructure was estimated/accounted for as both recharge and discharge features in the water balance; 5) explanation of how groundwater recharge from sewers was addressed in the model; 6) clarification of how surface water discharge was estimated and accounted for in the water balance; and 7) rationale for including some sewers in the water balance and excluding others across the site, including sewers in AOI 9.
10	Part 1, Section 5.2	The model domain was referenced as containing 1,273,230 total cells of which 1,180,578 are active cells. Clarification is needed to identify the location of the active and inactive cells on each layer.
11	Part 1, Sections 5.2 and 5.3.1	Clarification is needed to explain the implications of all layers being classified as constant transmissivity within the groundwater flow model and the impacts of this transmissivity classification to the site-specific hydraulic conductivities that are also referenced as being used.
12	Part 1, Sections 5.3	The groundwater flow model is based on assumptions of steady-state equilibrium conditions for each layer. Additional explanation is needed on how the presence or absence of confining layers impact the steady-state assumption. Transient modeling should be considered to better reflect site conditions.

Comment Number	Report Section	DEP Deficiency
13	Part 1, Section 6	Model calibration was performed using the 2017 dataset and then compared to water level observations from 2014, 2015, 2016, 2018, 2019, and 2021. The calibration statistics for each year of data comparison are acceptable, however there are areas across the site (i.e., locations where the horizontal river flow boundary is missing, active remediation is taking place, western side of the river, among others) that have significant residuals for all years modeled. These spatial and layer specific data calibration biases should be evaluated and addressed to improve the overall confidence in the model. Figures depicting calibration target residuals and observed versus simulated water levels should be plotted per layer for each year to better assess data biases.
14	Part 2, Section 2.2	Evergreen has identified a list of 21 site constituents of concern (COCs) that include 10 volatile organic compounds, 10 semi volatile organic compounds, and lead. The COCs evaluated in the fate and transport model include benzene, naphthalene, methyl tertiary-butyl ether (MTBE), benzo(a)pyrene, and lead. Additional site COCs need to be included in the transport model.
15	Part 2, Section 3.1	Statements regarding the results of the electrical resistivity imaging demonstrating that the middle clay minimizes the downward migration of shallow groundwater in the Belmont Terminal need to be re-evaluated, as well as the implications to the flow and transport models in this area. The resistivity dataset suggests preferential flow from the ground surface into bedrock, and a heterogeneous mix of high to low resistivity zones which do not support the conclusions in the text of the middle clay being effective at minimizing the downward migration of shallow impacts into the lower aquifer in the area of Belmont Terminal. In addition, additional evidence is needed to support electrical conductivity interpretations regarding biological activity, presence of gas pockets, and groundwater flow patterns.
16	Part 2, Section 3.4	Offsite monitoring wells were installed and sampled in 2022, southwest of AOI 4. High dissolved concentrations of target COCs were detected in these wells and were incorporated into the transport model. Additional clarification is needed to explain the findings of the compound specific isotope analysis (CSIA) dataset and implications to the transport model.

Comment Number	Report Section	DEP Deficiency
17	Part 2, Section 4.2.1.2	Degradation rates considered for the transport model included site-specific calculated values, literature values, and Chapter 250 values. The text indicates that degradation rates used in the model are consistent with literature values. The degradation rate used for MTBE is 2.5 times higher than literature values. A more detailed explanation of how the attenuation rates were determined is needed, or more conservative values should be used in the model.
18	Part 2, Section 4.2.2.2 and throughout remainder of report	The model relies on site-specific data for calculated aquifer properties and model input parameters. The monitoring well locations for layer- and parameter-specific measurements should be clearly described as well as the basis for excluded locations or data.
19	Part 2, Section 4.2.2.3	The use of a fraction organic carbon (foc) content of 0.05 should be supported by field data from the general areas and layers used in the model. The report indicates foc was analyzed in historical geotechnical assessments at the site, and the values used in the model are consistent with detected values. The geotechnical reports should be included to support the use of foc values used in the model. The high foc values used result in a high calculated retardation value, which needs to be justified and considered in the sensitivity analysis.
20	Part 2, Section 4.2.3.2	Clarification is needed to explain the dataset that was used and the basis for defining the boundary for onsite and offsite contributions in the model for the water-table aquifer impact at AOI 1 near the Defense Supply Center Philadelphia (DSCP) site boundary.
21	Part 2, Section 4.3	The initial and predicted concentration figures indicate a variable contaminant trend orientation. Explanation is needed to understand if anisotropic groundwater flow was evaluated as a possible cause of these apparent concentration trends.
22	Part 2, Section 4.3	The extent of the projected plumes must extend to the regional screening levels (RSLs) or calculated site-specific standards (SSS).

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23	Part 2, Section 4.4	Model uncertainty was evaluated by adjusting input parameters to evaluate parameter sensitivity. Decreases to degradation and retardation are identified as sensitive parameters that could result in plumes extending beyond the predicted extents. The approach to the overall fate and transport model was stated in the text as using conservative assumptions when possible, and this analysis supports the above comments about the foc and degradation rates used in the model. The figures in Appendix K need to show each uncertainty parameter modeled with plume extents to the RSLs or calculated numerical SSS.
24	Part 2, Section 5	Additional clarification is needed for assumptions made in the surface water modeling including: 1) justification for zero groundwater flow into the Schuylkill River during the rising and high tide; 2) how surface water dilution rates were calculated per cell; 3) the mass flux at discharge points for each COC; and 4) how mass from groundwater entering the onsite sewers and presumably discharging to the river was addressed in the model.
25	Part 2, Section 5	A reference for the fish consumption screening levels presented in the report is needed.
26	Part 2, Section 5	Legends need to be added or clarified on Figures 2.1, 2.6, 2.9, and 4.1 to explain surface water conditions and model assumptions.
27	Part 2, Section 6	Climate resiliency should also consider the potential for the redistribution of LNAPL during higher water table conditions.

Please address the above summarized technical deficiencies within 60 days. If the deficiencies noted above are corrected and a report resubmitted to DEP within 60 days, it will not be necessary to resubmit report review fees, resend the municipal notice, or republish the public notice. Please include a copy of this correspondence with any resubmission to confirm to DEP staff that an administrative completeness check is not necessary. If the corrected report is resubmitted later than 60 days from the date of this letter, the resubmitted report will need to include the appropriate fees and proofs of municipal and public notices.

We look forward to assisting you in the remediation of this property and encourage you to contact us throughout this process. If you have any questions or need further information regarding this matter, please contact Lisa Strobridge by email at lstrobridge@pa.gov or by telephone at 484.250.5796.

Any person aggrieved by this action may appeal the action to the Environmental Hearing Board (Board), pursuant to Section 4 of the Environmental Hearing Board Act, 35 P.S. § 7514, and the Administrative Agency Law, 2 Pa.C.S. Chapter 5A. The Board's address is:

Environmental Hearing Board
Rachel Carson State Office Building, Second Floor
400 Market Street
P.O. Box 8457
Harrisburg, PA 17105-8457

TDD users may contact the Environmental Hearing Board through the Pennsylvania Relay Service, 800.654.5984.

Appeals must be filed with the Board within 30 days of receipt of notice of this action unless the appropriate statute provides a different time. This paragraph does not, in and of itself, create any right of appeal beyond that permitted by applicable statutes and decisional law.

A Notice of Appeal form and the Board's rules of practice and procedure may be obtained online at http://ehb.courtapps.com or by contacting the Secretary to the Board at 717.787.3483. The Notice of Appeal form and the Board's rules are also available in braille and on audiotape from the Secretary to the Board.

IMPORTANT LEGAL RIGHTS ARE AT STAKE. YOU SHOULD SHOW THIS DOCUMENT TO A LAWYER AT ONCE. IF YOU CANNOT AFFORD A LAWYER, YOU MAY QUALIFY FOR FREE PRO BONO REPRESENTATION. CALL THE SECRETARY TO THE BOARD AT 717.787.3483 FOR MORE INFORMATION. YOU DO NOT NEED A LAWYER TO FILE A NOTICE OF APPEAL WITH THE BOARD.

IF YOU WANT TO CHALLENGE THIS ACTION, YOUR APPEAL MUST BE FILED WITH AND RECEIVED BY THE BOARD WITHIN 30 DAYS OF RECEIPT OF NOTICE OF THIS ACTION.

Sincerely,

Ragesh R Patel

Ragesh R. Patel
Regional Manager
Environmental Cleanup and Brownfields

cc: Mr. Cullinan, PE, Evergreen
Ms. Jennifer Menges, Stantec
Mr. Klingbeil, Stantec
Mr. Joseph Jeray, Hilco
Ms. Rainford, City of Philadelphia Department of Public Health
Mr. Bilash, U.S. EPA
Mr. Brown, P.G.
Ms. Strobridge, P.G.
Mr. Glass, Esq.
Mr. Serrat
Ms. Bass